CLAIMS

What is claimed is:

1. A method of controlling a reverse link power of a mobile station in a wireless communication network, the method comprising:

receiving a control signal from the mobile station that includes one or more codewords repeated at a desired power control rate;

determining quality metrics corresponding to the repeated codewords;

generating reverse link power control commands based on comparing the quality metrics to a power control set point; and

transmitting the reverse link power control commands to the mobile station.

2. The method of claim 1 further comprising determining a frame error rate for the control signal and adjusting the power control set point based on the frame error rate.

3. The method of claim 2 wherein the control signal includes error detection coding and wherein determining the frame error rate for the control channel comprises decoding the control signal based on the error detection coding to determine the frame error rate.

4. The method of claim 3 wherein the error detection coding comprises a cyclic redundancy check code.

5. The method of claim 1 wherein the control signal is a reverse packet data control channel signal associated with a reverse packet data channel signal transmitted by the mobile station.

6. The method of claim 5, wherein the control signal conveys control information associated with the reverse packet data channel signal.

7. The method of claim 6, wherein receiving a control signal from the mobile station that includes one or more codewords repeated at a desired power control rate comprises receiving the control signal and the reverse packet data channel signal at a base station included in the wireless communication network, and further comprising decoding the one or more repeated codewords to recover control information associated with the reverse packet data channel signal.

8. The method of claim 5, wherein a reverse link transmit power of the control signal is invariant with respect to a data rate of the reverse link packet data channel signal, and wherein a reverse link transmit power of the reverse link packet data channel signal is variant with respect to a data rate of the reverse link packet data channel signal.

9. A method of controlling a reverse link power of a mobile station in a wireless communication network, the method comprising:

receiving a control signal from the mobile station over a control channel associated with a reverse packet data channel associated with the mobile station, wherein the control channel has a data rate invariant transmit power level that does not vary with a transmit data rate of the reverse packet data channel, or having a transmit power that varies in a known relationship with the transmit data rate of the reverse packet data channel;

comparing the strength of the control signal to a power control set point;

generating a power control signal responsive to the comparison of the control signal to the power control set point; and

transmitting the power control signal to the mobile station.

10. The method of claim 9 further comprising determining a frame error rate for the control channel and adjusting the power control set point based on the frame error rate.

11. The method of claim 10 wherein the control signal includes error detection coding and wherein determining the frame error rate for the control channel comprises decoding the control signal based on the error detection coding to determine the frame error rate.

12. A radio base station comprising:

a receiver to receive from a mobile station:

a traffic signal transmitted over a data rate variant traffic channel having a transmit power level that varies depending on a data transmission rate on the traffic channel;

a control signal transmitted over a data rate invariant control channel having a data rate that does not change with the data transmission rate on the traffic channel;

a transmitter to transmit power control signals to the mobile station; and

a control unit to determine the power control signals based on the strength of the control signals received over the control channel.

13. The radio base station of claim 12 wherein the control unit determines the power control signals by comparing the strength of the control signals to a power control set point.

14. The radio base station of claim 13 wherein the control signal includes error detection coding and wherein the radio base station uses error detection coding to determine a frame error rate.

15. The radio base station of claim 14 wherein the control unit adjusts the power control set point based on the frame error rate for the control channel.

16. The radio base station of claim 15 wherein the error detection coding is a cyclic redundancy check code.

17. A method of transmit power control in a mobile station, the method comprising:

transmitting traffic signals over a data rate variant reverse traffic channel having a transmit power level that varies depending on a data transmission rate on the reverse traffic channel;

transmitting a control signal over a data rate invariant reverse control channel having a data rate that does not change with the data transmission rate on the reverse traffic channel; and

changing the transmit power level of the mobile station on the reverse traffic channel responsive to a change in the data transmission rate on the reverse traffic channel while maintaining the transmit power level on the reverse control channel at a current transmit power level for the control channel.

18. The method of claim 17 further comprising encoding control information transmitted on the reverse control channel with an error detection code to enable detection of frame errors at a receiver.

19. The method of claim 18 wherein encoding control information with the error detection code to enable detection of errors at the receiver comprises encoding the control information with a cyclic redundancy check code.

20. The method of claim 17 further comprising transmitting a pilot signal on a reverse pilot channel.

21. The method of claim 20 further comprising changing the transmit power level of the pilot signal responsive to a change in the data transmission rate, and slaving the transmit power level of the reverse traffic channel to the reverse pilot channel.

22. The method of claim 21 further comprising adjusting the channel gain of the reverse control channel relative to the reverse pilot channel responsive to a change in the data transmission rate so that the transmit power level of the reverse control channel does not change.

23. A mobile station comprising:

a transmitter for transmitting traffic signals over a data rate variant reverse traffic channel having a transmit power level that varies depending on a data transmission rate on the reverse traffic channel, and for transmitting a control signal over a data rate invariant reverse control channel having a data rate that does not change with the data transmission rate on the reverse traffic channel;

a receiver to receive power control signals from a radio base station; and

a control unit for controlling the transmit power level of the mobile station based on the power control signals, the control unit being operative to adjust the transmit power level of the mobile station on the reverse traffic channel responsive to a change in the data transmission rate on the reverse traffic channel while maintaining the transmit power level on the reverse control channel at a current transmit power level for the reverse control channel.

24. The mobile station of claim 23 wherein the control unit further encodes control information transmitted on the reverse control channel with an error detection code to enable detection of frame errors at a receiver.

25. The mobile station of claim 24 wherein the control unit encodes control information with a cyclic redundancy check code.

26. The mobile station of claim 23 wherein the transmitter transmits a pilot signal on a reverse pilot channel.

27. The mobile station of claim 26 further wherein the control unit adjusts the transmit power level of the pilot signal responsive to a change in the data transmission rate on the reverse traffic channel.

28. The method of claim 27 further wherein the control unit adjusts the channel gain of the reverse control channel relative to the reverse pilot channel responsive to the change in the data transmission rate so that the transmit power level of the reverse control channel does not change.

29. A method implemented by a mobile station of transmitting control information to a base station comprising:

encoding first control information to form a first codeword; and

repetitively transmitting the first codeword to a radio base station at a desired power control rate.

30. The method of claim 29 wherein the control information includes a rate indication indicative of the current data transmission rate of the mobile station on a reverse packet data channel.

31. The method of claim 30 wherein the control information includes at least one of a mobile status indication and a sequence indication.

32. The method of claim 29 wherein encoding control information to form a first codeword comprises encoding the first control information with one of the following encoder: a Hadamard encoder, a bi-orthogonal encoder, or a complementary orthogonal encoder.

33. The method of claim 29 further comprising:

generating error detection bits based on the first control information;

generating a second codeword based on the error detection bits, the second codeword having a number of symbols equal to the number of repetitions of the first codeword; and

applying each symbol of the second codeword to a respective repetition of the first codeword.

34. The method of claim 33 wherein generating error detection bits based on the first control information comprises generating error detection bits on a combination of the first control information and second control information.

35. The method of claim 33 wherein generating error detection bits based on the first control information comprises generating a cyclic redundancy check code on the first control information.

36. The method of claim 34 wherein generating a second codeword based on the error detection bits comprises generating the second codeword on a combination of the second control information and the error detection bits.

37. The method of claim 33 wherein the second control information includes at least one of a mobile status indication and a sequence indication.

38. A mobile station comprising:

a first encoder to encode first control information to generate a first codeword; and

a transmitter for repetitively transmitting the first codeword at a desired power control rate.

39. The mobile station of claim 38 wherein the first control information includes a rate indication indicative of the current data transmission rate of the mobile station on a reverse packet data channel.

40. The mobile station of claim 38 wherein the first control information includes one of a mobile status indication and a sequence indication.

41. The mobile station of claim 38 wherein the first encoder is one of the following encoders: a Hadamard encoder, a bi-orthogonal encoder, and a complementary orthogonal encoder.

42. The mobile station of claim 38 further comprising:

an error detection encoder to generate error detection bits based on the first control information;

a second encoder to generate a second codeword based on the error detection bits, the second codeword including a number of symbols equal to the number of repetitions of the first control information; and

a combiner to apply symbols of the second codeword to respective repetitions of the first codeword.

43. The mobile station of claim 42 wherein the second control information includes one of a sequence indication and a mobile status indication.

44. The mobile station of claim 42 wherein the error detection encoder is a cylic redundancy check encoder.

45. The mobile station of claim 42 wherein the error detection encoder generates error detection bits on a combination of the first control information and second control information.

46. The mobile station of claim 45 wherein the second encoder generates the second codeword on a combination of the error detection bits and the second control information.

47. A method of reverse link power control comprising:

receiving from a mobile station a repetitively transmitted first codeword in a plurality of successive slots of a control frame, wherein the slot timing corresponds to a desired power control rate;

separately decoding each slot to obtain a power metric for each slot; and

determining power control commands to send to the mobile station based on the power metrics.

48. The method of claim 47 wherein separately decoding each slot to obtain a power metric for each slot comprises correlating each slot with a set of possible codewords to obtain a correlation metric for each possible codeword, and selecting one correlation metric as the power metric.

49. The method of claim 47 further comprising:

receiving a pilot signal from the mobile station;

obtaining a phase reference from the pilot signal.

50. The method of claim 49 wherein separately decoding each slot to obtain a power metric for each slot comprises coherently correlating each slot using the phase reference with a set of possible codewords to obtain a correlation metric for each possible codeword, and selecting one correlation metric as the power metric.

51. The method of claim 50 wherein the selected correlation metric corresponds to a maximum likelihood codeword.

52. The method of claim 47 further comprising:

detecting frame errors based on an error detection code;

computing a frame error rate based on detected frame errors; and

adjusting a power control set point based on the frame error rate.

53. The method of claim 52 wherein the error detection code is included in a frame-level codeword having a number of symbols equal to the number of slots in a frame, and wherein the slots of the control frame are encoded with a corresponding symbol of the frame level codeword.

54. The method of claim 52 wherein the error detection code is determined by decoding the frame-level codeword.

55. A radio base station comprising:

a receiver to receive from a mobile station a repetitively transmitted first codeword in a plurality of successive slots of a control frame, wherein the slot timing corresponds to a desired power control rate;

a first decoder to separately decode each slot to obtain control information and a power metric for each slot;

a control unit to determine power control commands to send to the mobile station based on the power metrics from the decoder and a power control set point; and

a transmitter to transmit the power control commands to the mobile station.

56. The radio base station of claim 55 wherein the first decoder decodes each slot by correlating each slot with a set of possible codewords to obtain a correlation metric for each possible codeword, and selects one correlation metric as the power metric.

57. The radio base station of claim 55 further comprising a channel estimator for generating a phase reference from a pilot signal.

58. The radio base station of claim 57 wherein the first decoder uses said phase reference to coherently correlate each slot with a set of possible codewords to obtain a correlation metric for each possible codeword, and selects one correlation metric as the power metric.

59. The radio base station of claim 58 wherein the selected correlation metric corresponds to a maximum likelihood codeword.

60. The radio base station of claim 55 further comprising an error detection decoder to detect frame errors by detecting an error detection code associated with the repetitively transmitted first codeword and to compute a frame error rate therefrom.

61. The radio base station of claim 60 wherein the control unit adjusts the power control set point based on the frame error rate.

62. The radio base station of claim 60 wherein the error detection code is included in a frame-level codeword having a number of symbols equal to the number of slots in a frame, and wherein the slots of the control frame are encoded with a corresponding symbol of the frame level codeword.

63. The radio base station of claim 62 wherein the control unit decodes the frame-level codeword to determine the error detection code.

64. A method implemented by a mobile station of transmitting control information to a base station comprising:

encoding first control information to form a first codeword;

repetitively transmitting the first codeword to a radio base station a predetermined number of times;

generating error detection bits on the first control information;

encoding the error detection bits to form a second codeword having a number of elements equal to the number of repetitions of the first codeword; and

applying each element of the second codeword to a respective repetition of the first codeword.

65. The method of claim 64 wherein generating error detection bits on the first control information comprises generating error detection bits on a combination of the first control information and the second control information.

66. The method of claim 65 wherein encoding the error detection bits to form a second codeword having a number of elements equal to the number of repetitions of the first codeword comprises encoding a combination of the error detection and the second control information.

67. The method of claim 64 wherein applying each element of the second codeword to a respective repetition of the first codeword comprises changing the polarity of each repetition of the first codeword based on the second codeword.

68. A mobile station comprising:

a first encoder to generate a first codeword based on first control information;

a transmitter for repetitively transmitting the first codeword a predetermined number of times;

an error detection encoder to generate error detection bits based on the first control information;

a second encoder to generate a second codeword based on the error detection bits, the second codeword having a number of elements equal to the number of repetitions of the first codeword; and

a combiner to combine the first and second codewords for transmission to a base station.

69. The mobile station of claim 68 wherein the error detection encoder generates error detection bits on a combination of the first control information and second control information.

70. The mobile station of claim 69 wherein the second encoder generates the second codeword on a combination of the error detection bits and the second control information.

71. The mobile station of claim 68 wherein the combiner changes the polarity of each repetition of the first codeword based on the second codeword.